

ROYAL BANK OF CANADA  
Form 424B2  
September 04, 2018

RBC Capital Markets® Filed Pursuant to Rule 424(b)(2)  
Registration Statement No. 333-208507

Pricing Supplement \$1,327,000  
Dated August 30, 2018 Auto-Callable Contingent Coupon Barrier Notes  
To the Product Linked to the Lesser Performing of One Exchange  
Prospectus Supplement Traded Fund and One Equity Index, Due September 3,  
No. TP-1, the Prospectus 2020  
Supplement and the Royal Bank of Canada  
Prospectus, Each Dated  
January 8, 2016

Royal Bank of Canada is offering Auto-Callable Contingent Coupon Barrier Notes (the “Notes”) linked to the lesser performing of one exchange traded fund and one equity index (each, a “Reference Asset” and collectively, the “Reference Assets”). The Notes offered are senior unsecured obligations of Royal Bank of Canada, will pay a quarterly Contingent Coupon at the rate and under the circumstances specified below, and will have the terms described in the documents described above, as supplemented or modified by this pricing supplement.

Reference Assets	Initial Levels	Coupon Barriers and Trigger Levels
NASDAQ-100® Index (“NDX”)	7,642.670	5,349.869, which is 70.00% of its Initial Level
SPDR® S&P® Biotech ETF (“XBI”)	\$99.93	\$69.95, which is 70.00% of its Initial Level*

\* Rounded to two decimal places.

The Notes do not guarantee any return of principal at maturity. Any payments on the Notes are subject to our credit risk.

Investing in the Notes involves a number of risks. See “Risk Factors” beginning on page PS-5 of the product prospectus supplement dated January 8, 2016, on page S-1 of the prospectus supplement dated January 8, 2016, and “Selected Risk Considerations” beginning on page P-8 of this pricing supplement.

The Notes will not constitute deposits insured by the Canada Deposit Insurance Corporation, the U.S. Federal Deposit Insurance Corporation or any other Canadian or U.S. government agency or instrumentality.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of the Notes or determined that this pricing supplement is truthful or complete. Any representation to the contrary is a criminal offense.

Issuer:	Royal Bank of Canada	Stock Exchange Listing:	None
Trade Date:	August 30, 2018	Principal Amount:	\$1,000 per Note
Issue Date:	September 5, 2018	Maturity Date:	September 3, 2020
Observation Dates:	Quarterly, as set forth below.	Coupon Payment Dates:	Quarterly, as set forth below
Valuation Date:	August 31, 2020	Contingent Coupon Rate:	9.55% per annum

Contingent Coupon: If the Observation Level of each Reference Asset is greater than or equal to its Coupon Barrier on the applicable Observation Date, we will pay the Contingent Coupon applicable to the corresponding Observation Date. You may not receive any Contingent Coupons during the term of the Notes.

If the Notes are not previously called, we will pay you at maturity an amount based on the Final Level of the Lesser Performing Reference Asset:  
 For each \$1,000 in principal amount, \$1,000 plus the Contingent Coupon at maturity, unless the Final Level of the Lesser Performing Reference Asset is less than its Trigger Level.

**Payment at Maturity (if held to maturity):** If the Final Level of the Lesser Performing Reference Asset is less than its Trigger Level, then the investor will receive at maturity, for each \$1,000 in principal amount, a cash payment equal to:  
 $\$1,000 + (\$1,000 \times \text{Reference Asset Return of the Lesser Performing Reference Asset})$   
 Investors in the Notes could lose some or all of their principal amount if the Final Level of the Lesser Performing Reference Asset is below its Trigger Level.

**Lesser Performing Reference Asset:** The Reference Asset with the lowest Reference Asset Return.

**Call Feature:** If the Observation Level of each Reference Asset is greater than or equal to its Initial Level on any Observation Date starting on August 30, 2019 and on any Observation Date thereafter, the Notes will be automatically called for 100% of their principal amount, plus the Contingent Coupon applicable to the corresponding Observation Date.

**Call Settlement Dates:** The Coupon Payment Date corresponding to that Observation Date.

**Observation Level:** For the XBI, its closing price, and for the NDX, its closing level, on any Observation Date.

**Final Level:** For the XBI, its closing price on the Valuation Date, and for the NDX, its closing level on the Valuation Date.

**CUSIP:** 78013XB23

	Per Note	Total
Price to public	100.00%	\$1,327,000.00
Underwriting discounts and commissions	0.75%	\$9,952.50
Proceeds to Royal Bank of Canada	99.25%	\$1,317,047.50

The initial estimated value of the Notes as of the date of this pricing supplement is \$985.08 per \$1,000 in principal amount, which is less than the price to public. The actual value of the Notes at any time will reflect many factors, cannot be predicted with accuracy, and may be less than this amount. We describe our determination of the initial estimated value in more detail below.

RBC Capital Markets, LLC, which we refer to as RBCCM, acting as agent for Royal Bank of Canada, received a commission of \$7.50 per \$1,000 in principal amount of the Notes and used a portion of that commission to allow selling concessions to other dealers of \$7.50 per \$1,000 in principal amount of the Notes. The other dealers may forgo, in their sole discretion, some or all of their selling concessions. See “Supplemental Plan of Distribution (Conflicts of Interest)” below.

RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
 Lesser Performing of One Exchange Traded Fund and One  
 Equity Index  
 Royal Bank of Canada

SUMMARY

The information in this “Summary” section is qualified by the more detailed information set forth in this pricing supplement, the product prospectus supplement, the prospectus supplement, and the prospectus.

General:	<p>This pricing supplement relates to an offering of Auto-Callable Contingent Coupon Barrier Notes (the “Notes”) linked to the lesser performing of of the following (each, a “Reference Asset”, and collectively, the “Reference Assets”):</p> <ul style="list-style-type: none"> <li>(i) the shares of SPDR<sup>®</sup> S&amp;P<sup>®</sup> Biotech ETF (the “XBI”); and</li> <li>(ii) the NASDAQ-100<sup>®</sup> Index (the “NDX”).</li> </ul> <p>See “Additional Terms of your Notes Related to Indices” below, which relates to the NDX.</p>
Issuer:	Royal Bank of Canada (“Royal Bank”)
Issue:	Senior Global Medium-Term Notes, Series G
Trade Date:	August 30, 2018
Issue Date:	September 5, 2018
Denominations:	Minimum denomination of \$1,000, and integral multiples of \$1,000 thereafter.
Designated Currency:	U.S. Dollars
Contingent Coupon:	<p>We will pay you a Contingent Coupon during the term of the Notes, periodically in arrears on each Coupon Payment Date, under the conditions described below:</p> <ul style="list-style-type: none"> <li>· If the Observation Level of each Reference Asset is greater than or equal to its Coupon Barrier on the applicable Observation Date, we will pay the Contingent Coupon applicable to that Observation Date.</li> <li>· If the Observation Level of any Reference Asset is less than its Coupon Barrier on the applicable Observation Date, we will not pay you the Contingent Coupon applicable to that Observation Date.</li> </ul> <p>You may not receive a Contingent Coupon for one or more quarterly periods during the term of the Notes.</p>
Contingent Coupon Rate:	9.55% per annum (2.3875% per quarter)
Observation Dates:	Quarterly on November 30, 2018, February 28, 2019, May 30, 2019, August 30, 2019, November 29, 2019, February 28, 2020, May 29, 2020 and the Valuation Date.
Coupon Payment Dates:	The Contingent Coupon, if applicable, will be paid quarterly on December 5, 2018, March 5, 2019, June 4, 2019, September 5, 2019, December 4, 2019, March 4, 2020, June 3, 2020 and

the Maturity Date.

Record Dates:	The record date for each Coupon Payment Date will be the date one business day prior to that scheduled Coupon Payment Date; provided, however, that any Contingent Coupon payable at maturity or upon a call will be payable to the person to whom the payment at maturity or upon the call, as the case may be, will be payable.
Call Feature:	If, starting on August 30, 2019 and on any Observation Date thereafter, the Observation Level of each Reference Asset is greater than or equal to its Initial Level, then the Notes will be automatically called.
Payment if Called:	If the Notes are automatically called, then, on the applicable Call Settlement Date, for each \$1,000 principal amount, you will receive \$1,000 plus the Contingent Coupon otherwise due on that Call Settlement Date.
Call Settlement Dates:	If the Notes are called on any Observation Date starting on August 30, 2018, the Call Settlement Date will be the Coupon Payment Date corresponding to that Observation Date.
Valuation Date:	August 31, 2020

P-2 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
 Lesser Performing of One Exchange Traded Fund and One  
 Equity Index  
 Royal Bank of Canada

Maturity Date:	September 3, 2020
Initial Level:	For the XBI, its closing price, and for the NDX, its closing level, on the Trade Date, as specified on the cover page of this pricing supplement.
Final Level:	For the XBI, its closing price, and for the NDX, its closing level, on the Valuation Date.
Observation Level:	For the XBI, its closing price, and for the NDX, its closing level, on any Observation Date.
Trigger Level and Coupon Barrier:	For each Reference Asset, 70.00% of its Initial Level, as specified on the cover page of this pricing supplement.
Payment at Maturity (if not previously called and held to maturity):	<p>If the Notes are not previously called, we will pay you at maturity an amount based on the Final Level of the Lesser Performing Reference Asset:</p> <ul style="list-style-type: none"> <li>· If the Final Level of the Lesser Performing Reference Asset is greater than or equal to its Trigger Level, we will pay you a cash payment equal to the principal amount plus the Contingent Coupon otherwise due on the Maturity Date.</li> <li>· If the Final Level of the Lesser Performing Reference Asset is less than its Trigger Level, you will receive at maturity, for each \$1,000 in principal amount, a cash payment equal to: <math>\\$1,000 + (\\$1,000 \times \text{Reference Asset Return of the Lesser Performing Reference Asset})</math></li> </ul> <p>The amount of cash that you receive will be less than your principal amount, if anything, resulting in a loss that is proportionate to the decline of the Lesser Performing Reference Asset from the Trade Date to the Valuation Date. Investors in the Notes could lose some or all of their principal amount if the Final Level of the Lesser Performing Reference Asset is below its Trigger Level.</p>
Stock Settlement:	Not applicable. Payments on the Notes will be made solely in cash.
Reference Asset Return:	With respect to each Reference Asset: $\frac{\text{Final Level} - \text{Initial Level}}{\text{Initial Level}}$
Lesser Performing Reference Asset:	The Reference Asset with the lowest Reference Asset Return.
Market Disruption	The occurrence of a market disruption event (or a non-trading day) as to any of the Reference Assets will result in the postponement of an Observation Date or the Valuation Date as to that

- Events: Reference Asset, as described in the product prospectus supplement, but not to any non-affected Reference Asset.
- Calculation Agent: RBC Capital Markets, LLC (“RBCCM”)
- U.S. Tax Treatment: By purchasing a Note, each holder agrees (in the absence of a change in law, an administrative determination or a judicial ruling to the contrary) to treat the Note as a callable pre-paid cash-settled contingent income-bearing derivative contract linked to the Reference Assets for U.S. federal income tax purposes. However, the U.S. federal income tax consequences of your investment in the Notes are uncertain and the Internal Revenue Service could assert that the Notes should be taxed in a manner that is different from that described in the preceding sentence. Please see the section below, “Supplemental Discussion of U.S. Federal Income Tax Consequences,” and the discussion (including the opinion of our counsel Morrison & Foerster LLP) in the product prospectus supplement dated January 8, 2016 under “Supplemental Discussion of U.S. Federal Income Tax Consequences,” which apply to the Notes.
- Secondary Market: RBCCM (or one of its affiliates), though not obligated to do so, may maintain a secondary market in the Notes after the Issue Date. The amount that you may receive upon sale of your Notes prior to maturity may be less than the principal amount.
- Listing: The Notes will not be listed on any securities exchange.
- Settlement: DTC global (including through its indirect participants Euroclear and Clearstream, Luxembourg as described under “Description of Debt Securities—Ownership and Book-Entry Issuance” in the prospectus dated January 8, 2016).

P-3 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

Terms Incorporated in the Master Note: All of the terms appearing above the item captioned “Secondary Market” on the cover page and pages P-2 and P-3 of this pricing supplement and the terms appearing under the caption “General Terms of the Notes” in the product prospectus supplement dated January 8, 2016, as modified by this pricing supplement. In addition to those terms, the following two sentences are also so incorporated into the master note: RBC confirms that it fully understands and is able to calculate the effective annual rate of interest applicable to the Notes based on the methodology for calculating per annum rates provided for in the Notes. RBC irrevocably agrees not to plead or assert Section 4 of the Interest Act (Canada), whether by way of defense or otherwise, in any proceeding relating to the Notes.

P-4 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### ADDITIONAL TERMS OF YOUR NOTES

You should read this pricing supplement together with the prospectus dated January 8, 2016, as supplemented by the prospectus supplement dated January 8, 2016 and the product prospectus supplement dated January 8, 2016, relating to our Senior Global Medium-Term Notes, Series G, of which these Notes are a part. Capitalized terms used but not defined in this pricing supplement will have the meanings given to them in the product prospectus supplement. In the event of any conflict, this pricing supplement will control. The Notes vary from the terms described in the product prospectus supplement in several important ways. You should read this pricing supplement carefully, including “- Additional Terms Relating to Indices” below, which relate to the NDX.

This pricing supplement, together with the documents listed below, contains the terms of the Notes and supersedes all prior or contemporaneous oral statements as well as any other written materials including preliminary or indicative pricing terms, correspondence, trade ideas, structures for implementation, sample structures, brochures or other educational materials of ours. You should carefully consider, among other things, the matters set forth in “Risk Factors” in the prospectus supplement dated January 8, 2016 and in the product prospectus supplement dated January 8, 2016, as the Notes involve risks not associated with conventional debt securities. We urge you to consult your investment, legal, tax, accounting and other advisors before you invest in the Notes. You may access these documents on the Securities and Exchange Commission (the “SEC”) website at [www.sec.gov](http://www.sec.gov) as follows (or if that address has changed, by reviewing our filings for the relevant date on the SEC website):

Prospectus dated January 8, 2016:

<http://www.sec.gov/Archives/edgar/data/1000275/000121465916008810/j18160424b3.htm>

Prospectus Supplement dated January 8, 2016:

<http://www.sec.gov/Archives/edgar/data/1000275/000121465916008811/p14150424b3.htm>

Product Prospectus Supplement dated January 8, 2016:

<https://www.sec.gov/Archives/edgar/data/1000275/000114036116047446/form424b5.htm>

Our Central Index Key, or CIK, on the SEC website is 1000275. As used in this pricing supplement, “we,” “us,” or “our” refers to Royal Bank of Canada.

P-5 RBC Capital Markets, LLC

---



Auto-Callable Contingent Coupon Barrier Notes Linked to the  
 Lesser Performing of One Exchange Traded Fund and One  
 Equity Index  
 Royal Bank of Canada

#### HYPOTHETICAL EXAMPLES

The table set out below is included for illustration purposes only. The table illustrates the Payment at Maturity of the Notes (including the final Contingent Coupon, if payable) for a hypothetical range of performance for the Lesser Performing Reference Asset, assuming the following terms and that the Notes are not automatically called prior to maturity:

Hypothetical Trigger Level and Coupon Barrier:	70.00% of the hypothetical Initial Level of the Lesser Performing Reference Asset
Contingent Coupon Rate:	9.55% per annum (or 2.3875% per quarter).
Contingent Coupon Amount:	\$23.875 per quarter
Observation Dates:	Quarterly
Principal Amount:	\$1,000 per Note

We make no representation or warranty as to which of the Reference Assets will be the Lesser Performing Reference Asset. It is possible that the Final Level of each Reference Asset will be less than its Initial Level.

Hypothetical Final Levels of the Lesser Performing Reference Asset, expressed as a percentage of its Initial Level, are shown in the first column on the left. The second column shows the Payment at Maturity for a range of Reference Asset Returns on the Valuation Date. The third column shows the amount of cash to be paid on the Notes per \$1,000 in principal amount. If the Notes are called prior to maturity, the hypothetical examples below will not be relevant, and you will receive on the applicable Coupon Payment Date, for each \$1,000 principal amount, \$1,000 plus the Contingent Coupon otherwise due on the Notes.

Final Level of the Lesser Performing Reference Asset	Payment at Maturity as Percentage of Principal Amount	Cash Payment Amount per \$1,000 in Principal Amount
150.00%	102.3875%	\$1,023.875*
140.00%	102.3875%	\$1,023.875*
130.00%	102.3875%	\$1,023.875*
120.00%	102.3875%	\$1,023.875*
110.00%	102.3875%	\$1,023.875*
100.00%	102.3875%	\$1,023.875*
90.00%	102.3875%	\$1,023.875*
85.00%	102.3875%	\$1,023.875*
80.00%	102.3875%	\$1,023.875*
70.00%	102.3875%	\$1,023.875*
69.99%	69.9900%	\$699.900
60.00%	60.0000%	\$600.000
50.00%	50.0000%	\$500.000

Edgar Filing: ROYAL BANK OF CANADA - Form 424B2

40.00%	40.0000%	\$400.000
25.00%	25.0000%	\$250.000
0.00%	0.0000%	\$0.000

\*Including the final Contingent Coupon, if payable.

P-6 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

Hypothetical Examples of Amounts Payable at Maturity

The following hypothetical examples illustrate how the payments at maturity set forth in the table above are calculated, assuming the Notes have not been called.

Example 1: The Final Level of the Lesser Performing Reference Asset is 120%, an increase of 20% from its Initial Level. Because the Final Level of the Lesser Performing Reference Asset is greater than its Trigger Level and Coupon Barrier, the investor receives at maturity, in addition to the final Contingent Coupon otherwise due on the Notes, a cash payment of \$1,000 per Note, despite the 20% appreciation in the value of the Lesser Performing Reference Asset.

Example 2: The Final Level of the Lesser Performing Reference Asset is 90.00%, a decrease of 10% from its Initial Level. Because the Final Level of the Lesser Performing Reference Asset is greater than its Trigger Level and Coupon Barrier, the investor receives at maturity, in addition to the final Contingent Coupon otherwise due on the Notes, a cash payment of \$1,000 per Note, despite the 10% decline in the value of the Lesser Performing Reference Asset.

Example 3: The Final Level of the Lesser Performing Reference Asset is 50.00% on the Valuation Date, which is less than its Trigger Level and Coupon Barrier. Because the Final Level of the Lesser Performing Reference Asset is less than its Trigger Level and Coupon Barrier, the final Contingent Coupon will not be payable on the Maturity Date, and we will pay only \$500.00 for each \$1,000 in the principal amount of the Notes, calculated as follows:

Principal Amount + (Principal Amount x Reference Asset Return of the Lesser Performing Reference Asset)  
= \$1,000 + (\$1,000 x -50.00%) = \$1,000 - \$500.00 = \$500.00

\* \* \*

The Payments at Maturity shown above are entirely hypothetical; they are based on values of the Reference Assets that may not be achieved on the Valuation Date and on assumptions that may prove to be erroneous. The actual market value of your Notes on the Maturity Date or at any other time, including any time you may wish to sell your Notes, may bear little relation to the hypothetical Payments at Maturity shown above, and those amounts should not be viewed as an indication of the financial return on an investment in the Notes or on an investment in any Reference Asset or the securities included in any of the Reference Assets.

P-7 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### SELECTED RISK CONSIDERATIONS

An investment in the Notes involves significant risks. Investing in the Notes is not equivalent to investing directly in the Reference Assets. These risks are explained in more detail in the section “Risk Factors” in the product prospectus supplement. In addition to the risks described in the prospectus supplement and the product prospectus supplement, you should consider the following:

**Principal at Risk** — Investors in the Notes could lose all or a substantial portion of their principal amount if there is a decline in the value of the Lesser Performing Reference Asset between the Trade Date and the Valuation Date. If the Notes are not automatically called and the Final Level of the Lesser Performing Reference Asset on the Valuation Date is less than its Trigger Level, the amount of cash that you receive at maturity will represent a loss of your principal that is proportionate to the decline in the closing price or closing level, as applicable, of the Lesser Performing Reference Asset from the Trade Date to the Valuation Date. Any Contingent Coupons received on the Notes prior to the Maturity Date may not be sufficient to compensate for any such loss.

**The Notes Are Subject to an Automatic Call** — If on any Observation Date beginning in August 2019, the Observation Level of each Reference Asset is greater than or equal to its Initial Level, then the Notes will be automatically called. If the Notes are automatically called, then, on the applicable Call Settlement Date, for each \$1,000 in principal amount, you will receive \$1,000 plus the Contingent Coupon otherwise due on the applicable Call Settlement Date. You will not receive any Contingent Coupons after the Call Settlement Date. You may be unable to reinvest your proceeds from the automatic call in an investment with a return that is as high as the return on the Notes would have been if they had not been called.

**You May Not Receive Any Contingent Coupons** — We will not necessarily make any coupon payments on the Notes. If the Observation Level of any of the Reference Assets on an Observation Date is less than its Coupon Barrier, we will not pay you the Contingent Coupon applicable to that Observation Date. If the Observation Level of any of the Reference Assets is less than its Coupon Barrier on each of the Observation Dates and on the Valuation Date, we will not pay you any Contingent Coupons during the term of, and you will not receive a positive return on your Notes. Generally, this non-payment of the Contingent Coupon coincides with a period of greater risk of principal loss on your Notes. Accordingly, if we do not pay the Contingent Coupon on the Maturity Date, you will also incur a loss of principal, because the Final Level of the Lesser Performing Reference Asset will be less than its Trigger Level.

**The Notes Are Linked to the Lesser Performing Reference Asset, Even if the Other Reference Asset Performs Better** — If any of the Reference Assets has a Final Level that is less than its Trigger Level, your return will be linked to the lesser performing of the two Reference Assets. Even if the Final Level of the other Reference Asset has increased compared to its Initial Level, or has experienced a decrease that is less than that of the Lesser Performing Reference Asset, your return will only be determined by reference to the performance of the Lesser Performing Reference Asset, regardless of the performance of the other Reference Asset.

**Your Payment on the Notes Will Be Determined by Reference to Each Reference Asset Individually, Not to a Basket, and the Payment at Maturity Will Be Based on the Performance of the Lesser Performing Reference Asset** — The Payment at Maturity will be determined only by reference to the performance of the Lesser Performing Reference Asset, regardless of the performance of the other Reference Asset. The Notes are not linked to a weighted basket, in which the risk may be mitigated and diversified among each of the basket components. For example, in the case of notes linked to a weighted basket, the return would depend on the weighted aggregate performance of the basket components reflected as the basket return. As a result, the depreciation of one basket component could be mitigated by the appreciation of the other basket component, as scaled by the weighting of that basket component. However, in the case of the Notes, the individual performance of each of the Reference Assets would not be combined, and the

depreciation of one Reference Asset would not be mitigated by any appreciation of the other Reference Asset. Instead, your return will depend solely on the Final Level of the Lesser Performing Reference Asset.

**The Call Feature and the Contingent Coupon Feature Limit Your Potential Return** — The return potential of the Notes is limited to the pre-specified Contingent Coupon Rate, regardless of the appreciation of the Reference Assets. In addition, the total return on the Notes will vary based on the number of Observation Dates on which the Contingent Coupon becomes payable prior to maturity or an automatic call. Further, if the Notes are called due to the Call Feature, you will not receive any Contingent Coupons or any other payment in respect of any Observation Dates after the applicable Call Settlement Date. Since the Notes could be called as early as August 2019, the total return on the Notes could be limited to one year. If the Notes are not called, you may be subject to the full downside performance of the Lesser Performing Reference Asset even though your potential return is limited to the Contingent Coupon Rate. As a result, the return on an investment in the Notes could be less than the return on a direct investment in the Reference Assets.

**Your Return May Be Lower than the Return on a Conventional Debt Security of Comparable Maturity** — The return that you will receive on the Notes, which could be negative, may be less than the return you could earn on other investments. Even if your return is positive, your return may be less than the return you would earn if you bought a conventional senior interest bearing debt security of Royal Bank.

P-8 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

Payments on the Notes Are Subject to Our Credit Risk, and Changes in Our Credit Ratings Are Expected to Affect the Market Value of the Notes — The Notes are our senior unsecured debt securities. As a result, your receipt of any Contingent Coupons, if payable, and the amount due on any relevant payment date is dependent upon our ability to repay its obligations on the applicable payment dates. This will be the case even if the values of the Reference Assets increase after the Trade Date. No assurance can be given as to what our financial condition will be at any time during the term of the Notes.

There May Not Be an Active Trading Market for the Notes-Sales in the Secondary Market May Result in Significant Losses — There may be little or no secondary market for the Notes. The Notes will not be listed on any securities exchange. RBCCM and our other affiliates may make a market for the Notes; however, they are not required to do so. RBCCM or any other affiliate of ours may stop any market-making activities at any time. Even if a secondary market for the Notes develops, it may not provide significant liquidity or trade at prices advantageous to you. We expect that transaction costs in any secondary market would be high. As a result, the difference between bid and asked prices for your Notes in any secondary market could be substantial.

The Initial Estimated Value of the Notes Is Less than the Price to the Public — The initial estimated value set forth on the cover page of this pricing supplement does not represent a minimum price at which we, RBCCM or any of our affiliates would be willing to purchase the Notes in any secondary market (if any exists) at any time. If you attempt to sell the Notes prior to maturity, their market value may be lower than the price you paid for them and the initial estimated value. This is due to, among other things, changes in the prices or levels of the Reference Assets, the borrowing rate we pay to issue securities of this kind, and the inclusion in the price to the public of the underwriting discount and the estimated costs relating to our hedging of the Notes. These factors, together with various credit, market and economic factors over the term of the Notes, are expected to reduce the price at which you may be able to sell the Notes in any secondary market and will affect the value of the Notes in complex and unpredictable ways. Assuming no change in market conditions or any other relevant factors, the price, if any, at which you may be able to sell your Notes prior to maturity may be less than your original purchase price, as any such sale price would not be expected to include the underwriting discount and the hedging costs relating to the Notes. In addition to bid-ask spreads, the value of the Notes determined by RBCCM for any secondary market price is expected to be based on the secondary rate rather than the internal funding rate used to price the Notes and determine the initial estimated value. As a result, the secondary price will be less than if the internal funding rate was used. The Notes are not designed to be short-term trading instruments. Accordingly, you should be able and willing to hold your Notes to maturity.

The Initial Estimated Value of the Notes on the Cover Page of this Pricing Supplement Is an Estimate Only, Calculated as of the Time the Terms of the Notes Were Set — The initial estimated value of the Notes is based on the value of our obligation to make the payments on the Notes, together with the mid-market value of the derivative embedded in the terms of the Notes. See “Structuring the Notes” below. Our estimate is based on a variety of assumptions, including our credit spreads, expectations as to dividends, interest rates and volatility, and the expected term of the Notes. These assumptions are based on certain forecasts about future events, which may prove to be incorrect. Other entities may value the Notes or similar securities at a price that is significantly different than we do. The value of the Notes at any time after the Trade Date will vary based on many factors, including changes in market conditions, and cannot be predicted with accuracy. As a result, the actual value you would receive if you sold the Notes in any secondary market, if any, should be expected to differ materially from the initial estimated value of your Notes.

Market Disruption Events and Adjustments — The payment at maturity, each Observation Date and the Valuation Date are subject to adjustment as described in the product prospectus supplement. For a description of what constitutes a

market disruption event as well as the consequences of that market disruption event, see “General Terms of the Notes—Market Disruption Events” in the product prospectus supplement.

**Owning the Notes Is Not the Same as Owning the XBI or the Securities Represented by the NDX** — The return on your Notes is unlikely to reflect the return you would realize if you actually owned shares of the XBI or the securities represented by the NDX. For instance, you will not receive or be entitled to receive any dividend payments or other distributions on these securities during the term of your Notes. As an owner of the Notes, you will not have voting rights or any other rights that holders of these securities may have. Furthermore, the Reference Assets may appreciate substantially during the term of the Notes, while your potential return will be limited to the applicable Contingent Coupon payments.

**Prior to Maturity, the Value of the Notes Will Be Influenced by Many Unpredictable Factors** — Many economic and market factors will influence the value of the Notes. We expect that, generally, the price or level of each Reference Asset on any day will affect the value of the Notes more than any other single factor. However, you should not expect the value of the Notes in the secondary market to vary in proportion to changes in the value of the Reference Assets. The value of the Notes will be affected by a number of other factors that may either offset or magnify each other, including:

Ø the market value of the Reference Assets;

Ø whether the market value of one or more of the Reference Assets is below the Coupon Barrier or the Trigger Level;

P-9 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

- Ø the expected volatility of the Reference Assets;
- Ø the time to maturity of the Notes;
- Ø the dividend rate on the Reference Assets or on the equity securities represented by the Reference Assets;
- Ø interest and yield rates in the market generally, as well as in the markets of the equity securities represented by the Reference Assets;
- Ø the occurrence of certain events relating to a Reference Asset that may or may not require an adjustment to the Initial Level, the Coupon Barrier and the Trigger Level;
- Ø economic, financial, political, regulatory or judicial events that affect the Reference Assets or the equity securities represented by the Reference Assets or stock markets generally, and which may affect the market value of the Reference Assets on any Observation Date; and
- Ø our creditworthiness, including actual or anticipated downgrades in our credit ratings.

Some or all of these factors will influence the price you will receive if you choose to sell your Notes prior to maturity. The impact of any of the factors set forth above may enhance or offset some or all of any change resulting from another factor or factors. You may have to sell your Notes at a substantial discount from the principal amount if the market value of the Reference Assets is at, below or not sufficiently above their Initial Levels, the Coupon Barrier or the Trigger Level.

**Our Business Activities May Create Conflicts of Interest** — We and our affiliates expect to engage in trading activities related to the securities included in or represented by the Reference Assets that are not for the account of holders of the Notes or on their behalf. These trading activities may present a conflict between the holders' interests in the Notes and the interests we and our affiliates will have in their proprietary accounts, in facilitating transactions, including options and other derivatives transactions, for their customers and in accounts under their management. These trading activities, if they influence the prices or levels of the Reference Assets, could be adverse to the interests of the holders of the Notes. We and one or more of our affiliates may, at present or in the future, engage in business with the securities included in or represented by the Reference Assets, including making loans to or providing advisory services. These services could include investment banking and merger and acquisition advisory services. These activities may present a conflict between our or one or more of our affiliates' obligations and your interests as a holder of the Notes. Moreover, we, and our affiliates may have published, and in the future expect to publish, research reports with respect to the Reference Assets or securities included in or represented by the Reference Assets. This research is modified from time to time without notice and may express opinions or provide recommendations that are inconsistent with purchasing or holding the Notes. Any of these activities by us or one or more of our affiliates may affect the prices or levels of the Reference Assets and, therefore, the market value of the Notes.

**Market Disruption Events and Adjustments** — The Payment at Maturity, each Observation Date and the Valuation Date are subject to adjustment as to each Reference Asset as described in the product prospectus supplement. For a description of what constitutes a market disruption event as well as the consequences of that market disruption event, see "General Terms of the Notes—Market Disruption Events" in the product prospectus supplement and the section "Additional Terms of the Notes" below.

**You Must Rely on Your Own Evaluation of the Merits of an Investment Linked to the Reference Assets** — In the ordinary course of their business, our affiliates may have expressed views on expected movements in the Reference Assets or the equity securities that they represent, and may do so in the future. These views or reports may be communicated to our clients and clients of our affiliates. However, these views are subject to change from time to time. Moreover, other professionals who transact business in markets relating to any Reference Asset may at any time have significantly different views from those of our affiliates. For these reasons, you are encouraged to derive



information concerning the Reference Assets from multiple sources, and you should not rely solely on views expressed by our affiliates.

**The XBI and its Underlying Index Are Different** — The performance of the XBI may not exactly replicate the performance of its underlying index, because the XBI will reflect transaction costs and fees that are not included in the calculation of its underlying index. It is also possible that the performance of the XBI may not fully replicate or may in certain circumstances diverge significantly from the performance of its underlying index due to the temporary unavailability of certain securities in the secondary market, the performance of any derivative instruments contained in the XBI or due to other circumstances. The XBI may use futures contracts, options, swap agreements, currency forwards and repurchase agreements in seeking performance that corresponds to its underlying index and in managing cash flows.

During periods of market volatility, securities underlying the XBI may be unavailable in the secondary market, market participants may be unable to calculate accurately the net asset value per share of the XBI and the liquidity of the XBI may be adversely affected. This kind of market volatility may also disrupt the ability of market participants to create and redeem shares of the XBI. Further, market volatility may adversely affect, sometimes materially, the prices at which market participants are willing to buy and sell shares of the XBI. As a result, under these circumstances, the market value of shares of the XBI may vary substantially

P-10 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

from the net asset value per share of the XBI. For all of the foregoing reasons, the performance of the XBI may not correlate with the performance of its underlying index as well as the net asset value per share of the XBI, which could materially and adversely affect the value of the Notes in the secondary market and/or reduce your payment at maturity.

**Management Risk** — The XBI is not managed according to traditional methods of “active” investment management, which involve the buying and selling of securities based on economic, financial and market analysis and investment judgment. Instead, the XBI, utilizing a “passive” or indexing investment approach, attempts to approximate the investment performance of its underlying index by investing in a portfolio of securities that generally replicate its underlying index. Therefore, unless a specific security is removed from its underlying index, the XBI generally would not sell a security because the security’s issuer was in financial trouble. In addition, the XBI is subject to the risk that the investment strategy of its investment advisor may not produce the intended results.

**The Policies of the XBI’s Investment Adviser Could Affect the Amount Payable on the Notes and Their Market Value** — The policies of the XBI’s investment adviser concerning the management of the XBI, additions, deletions or substitutions of the securities held by the XBI could affect the market price of shares of the XBI and, therefore, the amount payable on the Notes on the maturity date and the market value of the Notes before that date. The amount payable on the Notes and their market value could also be affected if the XBI’s investment adviser changes these policies, for example, by changing the manner in which it manages the XBI, or if the XBI’s investment adviser discontinues or suspends maintenance of the XBI, in which case it may become difficult to determine the market value of the Notes. The XBI’s investment advisers have no connection to the offering of the Notes and have no obligations to you as an investor in the Notes in making its decisions regarding the XBI.

**Changes that Affect an Index Will Affect the Market Value of the Notes and the Payments on the Notes** — The policies of the sponsor of each of the S&P<sup>®</sup> Biotechnology Select Industry<sup>®</sup> Index (which underlies the XBI) or the NDX concerning the calculation of the applicable index, additions, deletions or substitutions of the components of that index and the manner in which changes affecting those components, such as stock dividends, reorganizations or mergers, may be reflected in the index and, therefore, could affect the amounts payable on the Notes at maturity, and the market value of the Notes prior to maturity. The amounts payable on the Notes and their market value could also be affected if the index sponsor changes these policies, for example, by changing the manner in which it calculates the index, or if the index sponsor discontinues or suspends calculation or publication of the index, in which case it may become difficult to determine the market value of the Notes.

**We Have No Affiliation with any Index Sponsor and Will Not Be Responsible for any Actions Taken by an Index Sponsor** — No index sponsor is an affiliate of ours or will be involved in the offering of the Notes in any way. Consequently, we have no control of the actions of any index sponsor, including any actions of the type that might impact the value of the Notes. No index sponsor has any obligation of any sort with respect to the Notes. Thus, no index sponsor has any obligation to take your interests into consideration for any reason, including in taking any actions that might affect the value of the Notes. None of our proceeds from the issuance of the Notes will be delivered to any index sponsor.

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### ADDITIONAL TERMS OF YOUR NOTES RELATED TO INDICES

##### Closing Level

The closing level of the NDX on any trading day will equal its closing level published following the regular official weekday close of trading on that trading day.

A “trading day” as to the NDX means a day on which the principal trading market for that index is open for trading.

##### Unavailability of the Level of an Index

If the sponsor of the NDX discontinues publication of that index and its sponsor or another entity publishes a successor or substitute index that the calculation agent determines, in its sole discretion, to be comparable to the discontinued index (such successor or substitute index being referred to in this section as a “successor index”), then any subsequent index closing level will be determined by reference to the published level of that successor index at the regular weekday close of trading on the applicable trading day.

Upon any selection by the calculation agent of a successor index, the calculation agent will provide written notice to the trustee of the selection, and the trustee will furnish written notice thereof, to the extent the trustee is required to under the senior debt indenture, to each noteholder, or in the case of global notes, the depositary, as holder of the global notes.

If a successor index is selected by the calculation agent, that successor index will be used as a substitute for that index for all purposes, including for purposes of determining whether a market disruption event exists with respect to that index.

If the sponsor of the NDX discontinues publication of that index prior to, and that discontinuance is continuing on, any trading day on which the level of that index must be determined, and the calculation agent determines, in its sole discretion, that no successor index is available at that time, then the calculation agent will determine the level of that index for the relevant date in accordance with the formula for and method of calculating that index last in effect prior to the discontinuance, without rebalancing or substitution, using the closing level (or, if trading in the relevant underlying securities or components of that index have been materially suspended or materially limited, its good faith estimate of the closing level that would have prevailed but for that suspension or limitation) at the close of the principal trading session of the relevant exchange on that date of each security or component most recently comprising that index. Notwithstanding these alternative arrangements, discontinuance of the publication of the NDX may adversely affect the value of your Notes.

If at any time the method of calculating a closing level for the NDX or a successor index is changed in a material respect, or if the NDX is in any other way modified so that it does not, in the opinion of the calculation agent, fairly represent the level of the NDX had those changes or modifications not been made, then, from and after that time, the calculation agent will, at the close of business in New York City on the applicable trading day, make such calculations and adjustments as, in the good faith judgment of the calculation agent, may be necessary in order to arrive at a level of an index comparable to the NDX as if those changes or modifications had not been made. Accordingly, if the method of calculating the NDX is modified so that the value of the NDX is a fraction of what it would have been if it had not been modified (e.g., due to a split in the NDX), then the calculation agent will adjust the level of the NDX in order to arrive at a value of the NDX as if it had not been modified (e.g., as if such split had not occurred).

##### Index Market Disruption Events

A “market disruption event” with respect to the NDX means any event, circumstance or cause which we determine, and the calculation agent confirms, has or will have a material adverse effect on our ability to perform our obligations under the Notes or to hedge our position in respect of our obligations to make payment of amounts owing thereunder and more specifically includes the following events to the extent that they have such effect with respect to the NDX:

• a suspension, absence or limitation of trading in index components constituting 20% or more, by weight, of the NDX;  
• a suspension, absence or limitation of trading in futures or options contracts relating to an index on their respective markets;

• any event that disrupts or impairs, as determined by the calculation agent, the ability of market participants to (i) effect transactions in, or obtain market values for, index components constituting 20% or more, by weight, of the NDX, or (ii) effect transactions in, or obtain market values for, futures or options contracts relating to the NDX on their respective markets;

P-12 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

the closure on any day of the primary market for futures or options contracts relating to the NDX or index components constituting 20% or more, by weight, of the NDX on a scheduled trading day prior to the scheduled weekday closing time of that market (without regard to after hours or any other trading outside of the regular trading session hours) unless such earlier closing time is announced by the primary market at least one hour prior to the earlier of (i) the actual closing time for the regular trading session on such primary market on such scheduled trading day for such primary market and (ii) the submission deadline for orders to be entered into the relevant exchange system for execution at the close of trading on such scheduled trading day for such primary market; any scheduled trading day on which (i) the primary markets for index components constituting 20% or more, by weight, of the NDX or (ii) the exchanges or quotation systems, if any, on which futures or options contracts on the NDX are traded, fails to open for trading during its regular trading session; or any other event, if the calculation agent determines in its sole discretion that the event interferes with our ability or the ability of any of our affiliates to unwind all or a portion of a hedge with respect to the Notes that we or our affiliates have effected or may effect.

P-13 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### INFORMATION REGARDING THE REFERENCE ASSETS

We have derived the following information regarding each of the Reference Assets from publicly available documents. We

have not independently verified the accuracy or completeness of the following information. The selection of the Reference Assets is not a recommendation to buy or sell the shares of any security. Neither we nor any of our affiliates make any representation to you as to the performance of any of the Reference Assets. Information provided to or filed with the SEC under the Securities Exchange Act of 1934 and the Investment Company Act of 1940 relating to the XBI may be obtained through the SEC's website at <http://www.sec.gov>.

#### NASDAQ-100® Index ("NDX")

The NASDAQ-100® Index ("NDX") is a modified market capitalization-weighted index of 100 of the largest stocks of both U.S. and non-U.S. non-financial companies listed on The NASDAQ Stock Market based on market capitalization. It does not contain securities of financial companies, including investment companies. The NASDAQ-100® Index, which includes companies across a variety of major industry groups, was launched on January 31, 1985, with a base index value of 250.00. On January 1, 1994, the base index value was reset to 125.00. The NASDAQ OMX Group, Inc. publishes the NDX. Current information regarding the market value of the NDX is available from NASDAQ OMX Group, Inc. ("NASDAQ OMX") as well as numerous market information services. The share weights of the component securities of the NDX at any time are based upon the total shares outstanding in each of those securities and are additionally subject, in certain cases, to rebalancing. Accordingly, each underlying stock's influence on the level of the NDX is directly proportional to the value of its share weight.

#### Index Calculation

At any moment in time, the level of the NDX equals the aggregate value of the then-current share weights of each of the component securities, which are based on the total shares outstanding of each such component security, multiplied by each such security's respective last sale price on The NASDAQ Stock Market (which may be the official closing price published by The NASDAQ Stock Market), and divided by a scaling factor (the "divisor"), which becomes the basis for the reported level of the NDX. The divisor serves the purpose of scaling such aggregate value to a lower order of magnitude, which is more desirable for reporting purposes.

#### Underlying Stock Eligibility Criteria and Annual Ranking Review

##### Initial Eligibility Criteria

To be eligible for initial inclusion in the NDX, a security must be listed on The NASDAQ Stock Market and meet the following criteria:

- the security's U.S. listing must be exclusively on the NASDAQ Global Select Market or the NASDAQ Global Market;
- the security must be issued by a non-financial company;
- the security may not be issued by an issuer currently in bankruptcy proceedings;
- the security must generally be a common stock, ordinary share, American Depositary Receipt, or tracking stock (closed-end funds, convertible debentures, exchange traded funds, limited liability companies, limited partnership interests, preferred stocks, rights, shares or units of beneficial interests, warrants, units and other derivative securities are not included in the NDX, nor are the securities of investment companies);
- the security must have a three-month average daily trading volume of at least 200,000 shares;
- if the security is issued by an issuer organized under the laws of a jurisdiction outside the United States, it must have listed options on a recognized market in the United States or be eligible for listed-options trading on a recognized options market in the United States;

- the issuer of the security may not have entered into a definitive agreement or other arrangement which would likely result in the security no longer being eligible;
- the issuer of the security may not have annual financial statements with an audit opinion that is currently withdrawn;
- and
- the issuer of the security must have “seasoned” on the NASDAQ Stock Market or another recognized market (generally, a company is considered to be seasoned if it has been listed on a market for at least three full months, excluding the first month of initial listing).

Continued Eligibility Criteria

In addition, to be eligible for continued inclusion in the NDX the following criteria apply:

- the security’s U.S. listing must be exclusively on the NASDAQ Global Select Market or the NASDAQ Global Market;
- the security must be issued by a non-financial company;

P-14 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

- the security may not be issued by an issuer currently in bankruptcy proceedings;
  - the security must have an average daily trading volume of at least 200,000 shares in the previous three-month trading period as measured annually during the ranking review process described below;
  - if the issuer of the security is organized under the laws of a jurisdiction outside the United States, then such security must have listed options on a recognized market in the United States or be eligible for listed-options trading on a recognized options market in the United States, as measured annually during the ranking review process;
  - the issuer of the security may not have entered into a definitive agreement or other arrangement that would likely result in the security no longer being eligible;
  - the security must have an adjusted market capitalization equal to or exceeding 0.10% of the aggregate adjusted market capitalization of the NDX at each month-end. In the event that a company does not meet this criterion for two consecutive month-ends, it will be removed from the NDX effective after the close of trading on the third Friday of the following month; and
  - the issuer of the security may not have annual financial statements with an audit opinion that is currently withdrawn.
- These eligibility criteria may be revised from time to time by NASDAQ OMX without regard to the Notes.

Annual Ranking Review

The component securities are evaluated on an annual basis (the “Ranking Review”), except under extraordinary circumstances, which may result in an interim evaluation, as follows. Securities that meet the applicable eligibility criteria are ranked by market value. eligible securities that are already in the NDX and that are ranked in the top 100 eligible securities (based on market capitalization) are retained in the NDX. A security that is ranked 101 to 125 is also retained, provided that such security was ranked in the top 100 eligible securities as of the previous Ranking Review or was added to the NDX subsequent to the previous Ranking Review. Securities not meeting such criteria are replaced. The replacement securities chosen are those eligible securities not currently in the NDX that have the largest market capitalization. The data used in the ranking includes end of October market data and is updated for total shares outstanding submitted in a publicly filed SEC document via EDGAR through the end of November.

Replacements are made effective after the close of trading on the third Friday in December. Moreover, if at any time during the year other than the Ranking Review, a component security is determined by NASDAQ OMX to become ineligible for continued inclusion in the NDX, the security will be replaced with the largest market capitalization security meeting the eligibility criteria listed above and not currently included in the NDX.

Index Maintenance

In addition to the Ranking Review, the securities in the NDX are monitored every day by NASDAQ OMX with respect to changes in total shares outstanding arising from corporate events, such as stock dividends, stock splits and certain spin-offs and rights issuances. NASDAQ OMX has adopted the following quarterly scheduled weight adjustment procedures with respect to those changes. If the change in total shares outstanding arising from a corporate action is greater than or equal to 10%, that change will be made to the NDX as soon as practical, normally within ten days of such corporate action. Otherwise, if the change in total shares outstanding is less than 10%, then all such changes are accumulated and made effective at one time on a quarterly basis after the close of trading on the third Friday in each of March, June, September and December.

In either case, the share weights for those component securities are adjusted by the same percentage amount by which the total shares outstanding have changed in those securities. Ordinarily, whenever there is a change in the share weights, a change in a component security, or a change to the price of a component security due to spin-off, rights issuances or special cash dividends, NASDAQ OMX adjusts the divisor to ensure that there is no discontinuity in the level of the NDX that might otherwise be caused by any of those changes. All changes will be announced in advance.



### Index Rebalancing

Under the methodology employed, on a quarterly basis coinciding with NASDAQ OMX's quarterly scheduled weight adjustment procedures, the component securities are categorized as either "Large Stocks" or "Small Stocks" depending on whether their current percentage weights (after taking into account scheduled weight adjustments due to stock repurchases, secondary offerings or other corporate actions) are greater than, or less than or equal to, the average percentage weight in the NDX (i.e., as a 100-stock index, the average percentage weight in the NDX is 1%).

This quarterly examination will result in an index rebalancing if it is determined that: (1) the current weight of the single largest market capitalization component security is greater than 24% or (2) the "collective weight" of those component securities, the individual current weights of which are in excess of 4.5%, when added together, exceed 48%. In addition, NASDAQ OMX may conduct a special rebalancing at any time if it is determined to be necessary to maintain the integrity of the NDX.

P-15 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

If either one or both of these weight distribution requirements are met upon quarterly review, or NASDAQ OMX determines that a special rebalancing is required, a weight rebalancing will be performed. First, relating to weight distribution requirement (1) above, if the current weight of the single largest component security exceeds 24%, then the weights of all Large Stocks will be scaled down proportionately towards 1% by enough of an amount for the adjusted weight of the single largest component security to be set to 20%. Second, relating to weight distribution requirement (2) above, for those component securities whose individual current weights or adjusted weights in accordance with the preceding step are in excess of 4.5%, if their “collective weight” exceeds 48%, then the weights of all Large Stocks will be scaled down proportionately towards 1% by just enough amount for the “collective weight,” so adjusted, to be set to 40%.

The aggregate weight reduction among the Large Stocks resulting from either or both of the above rescalings will then be redistributed to the Small Stocks in the following iterative manner. In the first iteration, the weight of the largest Small Stock will be scaled upwards by a factor which sets it equal to the average Index weight of 1.0%. The weights of each of the smaller remaining Small Stocks will be scaled up by the same factor, reduced in relation to each stock’s relative ranking among the Small Stocks, such that the smaller the component security in the ranking, the less the scale-up of its weight. This is intended to reduce the market impact of the weight rebalancing on the smallest component securities in the NDX.

In the second iteration, the weight of the second largest Small Stock, already adjusted in the first iteration, will be scaled upwards by a factor which sets it equal to the average index weight of 1%. The weights of each of the smaller remaining Small Stocks will be scaled up by this same factor, reduced in relation to each stock’s relative ranking among the Small Stocks, such that, once again, the smaller the component stock in the ranking, the less the scale-up of its weight.

Additional iterations will be performed until the accumulated increase in weight among the Small Stocks exactly equals the aggregate weight reduction among the Large Stocks from rebalancing in accordance with weight distribution requirement (1) and/or weight distribution requirement (2).

Then, to complete the rebalancing procedure, once the final percent weights of each of the component securities are set, the share weights will be determined anew based upon the last sale prices and aggregate capitalization of the NDX at the close of trading on the last day in February, May, August and November. Changes to the share weights will be made effective after the close of trading on the third Friday in March, June, September and December, and an adjustment to the divisor will be made to ensure continuity of the NDX.

Ordinarily, new rebalanced weights will be determined by applying the above procedures to the current share weights. However, NASDAQ OMX may from time to time determine rebalanced weights, if necessary, by instead applying the above procedure to the actual current market capitalization of the component securities. In those instances, NASDAQ OMX would announce the different basis for rebalancing prior to its implementation.

The SPDR® S&P® Biotech ETF (“XBI”)

The XBI is an investment portfolio maintained and managed by SSgA Funds Management, Inc. (“SSFM”). SSFM is the investment advisor to separate investment portfolios, including the XBI, each of which are offered by the Select Sector SPDR Trust, a registered investment company. The Notes are not sponsored, endorsed, sold or promoted by the investment adviser. The investment adviser makes no representations or warranties to the owners of the Notes or any member of the public regarding the advisability of investing in the Notes. The investment adviser has no obligation or liability in connection with the operation, marketing, trading or sale of the Notes.

The XBI seeks to provide investment results that correspond generally to the price and yield performance, before fees and expenses, of the S&P® Biotechnology Select Industry® Index (the “underlying index”). The underlying index

represents the biotechnology sub-industry portion of the Standard & Poor's ("S&P") Total Market Index ("S&P TMI"), an index that measures the performance of the U.S. equity market. The XBI is composed of companies that are in the biotechnology sector. The XBI trades on NYSE Arca under the ticker symbol "XBI."

The XBI utilizes a "replication" investment approach in attempting to track the performance of the underlying index. The XBI typically invests in substantially all of the securities which comprise the underlying index in approximately the same proportions as the underlying index. The XBI will normally invest at least 80% of its total assets in the common stocks that comprise the underlying index.

The S&P® Biotechnology Select Industry® Index

The underlying index is an equal-weighted index that is designed to measure the performance of the biotechnology sub-industry portion of the S&P TMI. The S&P TMI includes all U.S. common equities listed on the New York Stock Exchange (the "NYSE") (including NYSE Arca), the NYSE MKT, the Nasdaq Global Select Market, and the Nasdaq Capital Market. Each of the component stocks in the underlying index is a constituent company within the biotechnology sub-industry portion of the S&P TMI.

To be eligible for inclusion in the underlying index, companies must be in the S&P TMI and must be included in the relevant Global Industry Classification Standard (GICS) sub-industry. The GICS was developed to establish a global standard for

P-16 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

categorizing companies into sectors and industries. In addition to the above, companies must satisfy one of the two following combined size and liquidity criteria:

- float-adjusted market capitalization above US\$500 million and float-adjusted liquidity ratio above 90%; or
- float-adjusted market capitalization above US\$400 million and float-adjusted liquidity ratio above 150%.

All U.S. companies satisfying these requirements are included in the underlying index. The total number of companies in the underlying index should be at least 35. If there are fewer than 35 stocks, stocks from a supplementary list of highly correlated sub-industries that meet the market capitalization and liquidity thresholds above are included in order of their float-adjusted market capitalization to reach 35 constituents. Minimum market capitalization requirements may be relaxed to ensure there are at least 22 companies in the underlying index as of each rebalancing effective date.

Eligibility factors include:

**Market Capitalization:** Float-adjusted market capitalization should be at least US\$400 million for inclusion in the underlying index. Existing index components must have a float-adjusted market capitalization of US\$300 million to remain in the underlying index at each rebalancing.

**Liquidity:** The liquidity measurement used is a liquidity ratio, defined as dollar value traded over the previous 12-months divided by the float-adjusted market capitalization as of the underlying index rebalancing reference date. Stocks having a float-adjusted market capitalization above US\$500 million must have a liquidity ratio greater than 90% to be eligible for addition to the underlying index. Stocks having a float-adjusted market capitalization between US\$400 and US\$500 million must have a liquidity ratio greater than 150% to be eligible for addition to the underlying index. Existing index constituents must have a liquidity ratio greater than 50% to remain in the underlying index at the quarterly rebalancing. The length of time to evaluate liquidity is reduced to the available trading period for IPOs or spin-offs that do not have 12 months of trading history.

**Takeover Restrictions:** At the discretion of S&P, constituents with shareholder ownership restrictions defined in company bylaws may be deemed ineligible for inclusion in the underlying index. Ownership restrictions preventing entities from replicating the index weight of a company may be excluded from the eligible universe or removed from the underlying index.

**Turnover:** S&P believes turnover in index membership should be avoided when possible. At times, a company may appear to temporarily violate one or more of the addition criteria. However, the addition criteria are for addition to the underlying index, not for continued membership. As a result, an index constituent that appears to violate the criteria for addition to the underlying index will not be deleted unless ongoing conditions warrant a change in the composition of the underlying index.

P-17 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### HISTORICAL INFORMATION

The graphs below set forth the information relating to the historical performance of the Reference Assets. In addition, below the graphs are tables setting forth the intra-day high, intra-day low and period-end closing prices or levels of the Reference Assets. The information provided in these tables is for the period from January 1, 2008 through August 30, 2018.

We obtained the information regarding the historical performance of the Reference Assets in the graphs and tables below from Bloomberg Financial Markets.

We have not independently verified the accuracy or completeness of the information obtained from Bloomberg Financial Markets. The historical performance of any Reference Asset should not be taken as an indication of its future performance, and no assurance can be given as to the prices or levels of the Reference Assets at any time. We cannot give you assurance that the performance of the Reference Assets will not result in the loss of all or part of your investment.

P-18 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
 Lesser Performing of One Exchange Traded Fund and One  
 Equity Index  
 Royal Bank of Canada

Historical Information for NASDAQ-100® Index (“NDX”)

Below is a table setting forth the intra-day high, intra-day low and period-end closing levels of this Reference Asset. The information provided in the table is for the period from January 1, 2008 through August 30, 2018.

Period-Start Date	Period-End Date	High Intra-Day Level of this Reference Asset	Low Intra-Day Level of this Reference Asset	Period-End Closing Level of this Reference Asset
1/1/2008	3/31/2008	2,094.220	1,668.570	1,781.930
4/1/2008	6/30/2008	2,055.820	1,776.600	1,837.090
7/1/2008	9/30/2008	1,973.560	1,496.150	1,594.630
10/1/2008	12/31/2008	1,584.260	1,018.860	1,201.340
1/1/2009	3/31/2009	1,286.680	1,040.520	1,237.010
4/1/2009	6/30/2009	1,511.940	1,211.600	1,477.250
7/1/2009	9/30/2009	1,754.540	1,394.870	1,718.990
10/1/2009	12/31/2009	1,882.580	1,652.440	1,872.020
1/1/2010	3/31/2010	1,976.380	1,712.890	1,958.340
4/1/2010	6/30/2010	2,059.420	1,734.900	1,739.140
7/1/2010	9/30/2010	2,029.650	1,700.040	1,998.040
10/1/2010	12/31/2010	2,238.920	1,963.680	2,225.720
1/1/2011	3/31/2011	2,403.520	2,188.920	2,338.990
4/1/2011	6/30/2011	2,417.830	2,180.940	2,325.070
7/1/2011	9/30/2011	2,438.440	2,034.920	2,139.180
10/1/2011	12/31/2011	2,412.520	2,042.900	2,277.830
1/1/2012	3/31/2012	2,403.520	2,188.920	2,338.990
4/1/2012	6/30/2012	2,417.830	2,180.940	2,325.070
7/1/2012	9/30/2012	2,438.440	2,034.920	2,139.180
10/1/2012	12/31/2012	2,412.520	2,042.900	2,277.830
1/1/2013	3/31/2013	2,820.669	2,689.830	2,818.690
4/1/2013	6/30/2013	3,053.507	2,730.967	2,909.599
7/1/2013	9/30/2013	3,248.523	2,913.479	3,218.198
10/1/2013	12/31/2013	3,591.996	3,117.693	3,591.996
1/1/2014	3/31/2014	3,738.319	3,418.883	3,595.736
4/1/2014	6/30/2014	3,860.646	3,414.107	3,849.479
7/1/2014	9/30/2014	4,118.908	3,837.155	4,049.445
10/1/2014	12/31/2014	4,347.087	3,700.225	4,236.279
1/1/2015	3/31/2015	4,483.970	4,078.848	4,382.819
4/1/2015	6/30/2015	4,562.333	4,283.913	4,379.865
7/1/2015	9/30/2015	4,694.134	3,787.227	4,083.372
10/1/2015	12/31/2015	4,739.753	4,124.545	4,652.008
1/1/2016	3/31/2016	3,888.781	4,490.875	4,522.119
4/1/2016	6/30/2016	4,179.735	4,364.738	4,574.383
7/1/2016	9/30/2016	4,375.724	4,838.300	4,895.496
10/1/2016	12/31/2016	4,647.590	4,863.620	4,992.078
1/1/2017	3/31/2017	5,451.497	4,884.522	5,436.232

Edgar Filing: ROYAL BANK OF CANADA - Form 424B2

4/1/2017	6/30/2017	5,897.688	5,353.586	5,646.917
7/1/2017	9/29/2017	6,012.954	5,579.641	5,979.298
10/1/2017	12/31/2017	6,522.699	5,955.829	6,396.422
1/1/2018	3/31/2018	7,186.088	6,164.428	6,581.126
4/1/2018	6/30/2018	7,309.992	6,322.604	7,040.802
7/1/2018	8/30/2018	7,691.102	6,969.158	7,642.670

PAST PERFORMANCE IS NOT INDICATIVE OF FUTURE RESULTS.

P-19 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

The graph below illustrates the performance of this Reference Asset from January 1, 2008 to August 30, 2018, reflecting its Initial Level of 7,642.670. The red line represents its Coupon Barrier and Trigger Level of 5,349.869, which is equal to 70.00% of its Initial Level.

P-20 RBC Capital Markets, LLC

---



Auto-Callable Contingent Coupon Barrier Notes Linked to the  
 Lesser Performing of One Exchange Traded Fund and One  
 Equity Index  
 Royal Bank of Canada

Historical Information for the SPDR® S&P® Biotech ETF (“XBI”)

Below is a table setting forth the intra-day high, intra-day low and period-end closing prices of this Reference Asset. The information provided in the table is for the period from January 1, 2008 through August 30, 2018.

Period-Start Date	Period-End Date	High Intra-Day Price of this Reference Asset (\$)	Low Intra-Day Price of this Reference Asset (\$)	Period-End Closing Price of this Reference Asset (\$)
1/1/2008	3/31/2008	20.57	16.02	17.84
4/1/2008	6/30/2008	20.17	18.09	19.20
7/1/2008	9/30/2008	23.26	18.69	20.16
10/1/2008	12/31/2008	20.18	14.35	17.60
1/1/2009	3/31/2009	18.86	14.36	16.05
4/1/2009	6/30/2009	17.14	14.39	16.90
7/1/2009	9/30/2009	18.97	15.56	17.89
10/1/2009	12/31/2009	18.14	15.52	18.04
1/1/2010	3/31/2010	20.70	17.82	19.98
4/1/2010	6/30/2010	20.66	15.96	17.26
7/1/2010	9/30/2010	19.86	16.49	19.79
10/1/2010	12/31/2010	21.53	19.31	21.20
1/1/2011	3/31/2011	22.26	20.35	22.26
4/1/2011	6/30/2011	25.29	22.29	24.37
7/1/2011	9/30/2011	25.24	18.24	19.84
10/1/2011	12/31/2011	22.68	18.68	22.13
1/1/2012	3/31/2012	27.56	21.94	26.79
4/1/2012	6/30/2012	30.00	24.29	29.49
7/1/2012	9/30/2012	32.20	28.12	31.14
10/1/2012	12/31/2012	32.15	27.13	29.30
1/1/2013	3/31/2013	33.58	29.99	33.29
4/1/2013	6/30/2013	37.84	32.13	34.75
7/1/2013	9/30/2013	44.14	35.68	43.05
10/1/2013	12/31/2013	44.11	37.79	43.40
1/1/2014	3/31/2014	57.50	42.70	47.49
4/1/2014	6/30/2014	51.92	38.46	51.35
7/1/2014	9/30/2014	54.64	44.66	51.99
10/1/2014	12/31/2014	63.90	47.28	62.21
1/1/2015	3/31/2015	81.57	60.67	75.17
4/1/2015	6/30/2015	87.20	67.88	84.08
7/1/2015	9/30/2015	91.11	59.16	62.25
10/1/2015	12/31/2015	73.80	60.27	70.08
1/1/2016	3/31/2016	69.11	44.16	51.66
4/1/2016	6/30/2016	59.87	48.98	54.09
7/1/2016	9/30/2016	69.20	53.80	66.29
10/1/2016	12/31/2016	68.16	53.16	59.19
1/1/2017	3/31/2017	72.58	58.67	69.34

Edgar Filing: ROYAL BANK OF CANADA - Form 424B2

4/1/2017	6/30/2017	80.84	66.00	77.18
7/1/2017	9/30/2017	86.68	74.26	86.57
10/1/2017	12/29/2017	88.98	78.46	84.87
1/1/2018	3/31/2018	97.96	82.38	87.73
4/1/2018	6/30/2018	101.52	82.37	95.19
7/1/2018	8/30/2018	101.16	92.51	99.93

PAST PERFORMANCE IS NOT INDICATIVE OF FUTURE RESULTS.

P-21 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

The graph below illustrates the performance of this Reference Asset from January 1, 2008 to August 30, 2018, reflecting its Initial Level of \$99.93. The red line represents its Coupon Barrier and Trigger Level of \$69.95, which is equal to 70.00% of its Initial Level, rounded to two decimal places.

P-22 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### USE OF PROCEEDS AND HEDGING

In anticipation of the sale of the Notes, we expect to enter into hedging transactions with one or more of our affiliates, involving purchases of the securities represented by the Reference Assets, shares of the XBI and/or listed and/or over-the-counter derivative instruments related to any of those securities or the Reference Assets prior to or on the Trade Date. From time to time, including around the time of each Observation Date and the Maturity Date, we, RBCCM, and our other affiliates may enter into additional hedging transactions or unwind those that we or they have entered into. In this regard, we, RBCCM, and our other affiliates may:

- acquire or dispose of investments relating to the Reference Assets;
- acquire or dispose of long or short positions in listed or over-the-counter derivative instruments based on the Reference Assets; or
- any combination of the above two.

We, RBCCM and our other affiliates may acquire a long or short position in securities similar to the Notes from time to time and may, in our or their sole discretion, hold or resell those similar securities.

We, RBCCM and our other affiliates may close out our or their hedges on or before any Observation Date. That step may involve sales or purchases of the securities represented by the Reference Assets, shares of the XBI, or over-the-counter derivative instruments linked to the Reference Assets.

#### SUPPLEMENTAL DISCUSSION OF U.S. FEDERAL INCOME TAX CONSEQUENCES

The following disclosure supplements, and to the extent inconsistent supersedes, the discussion in the product prospectus supplement dated January 8, 2016 under “Supplemental Discussion of U.S. Federal Income Tax Consequences.” The discussions below and in the accompanying product prospectus supplement do not address the tax consequences applicable to holders subject to Section 451(b) of the Code.

Under Section 871(m) of the Code, a “dividend equivalent” payment is treated as a dividend from sources within the United States. Such payments generally would be subject to a 30% U.S. withholding tax if paid to a non-U.S. holder. Under U.S. Treasury Department regulations, payments (including deemed payments) with respect to equity-linked instruments (“ELIs”) that are “specified ELIs” may be treated as dividend equivalents if such specified ELIs reference an interest in an “underlying security,” which is generally any interest in an entity taxable as a corporation for U.S. federal income tax purposes if a payment with respect to such interest could give rise to a U.S. source dividend. However, the IRS has issued guidance that states that the U.S. Treasury Department and the IRS intend to amend the effective dates of the U.S. Treasury Department regulations to provide that withholding on dividend equivalent payments will not apply to specified ELIs that are not delta-one instruments and that are issued before January 1, 2019. Based on our determination that the Notes are not delta-one instruments, non-U.S. holders should not be subject to withholding on dividend equivalent payments, if any, under the Notes. However, it is possible that the Notes could be treated as deemed reissued for U.S. federal income tax purposes upon the occurrence of certain events affecting the Reference Assets or the Notes (for example, upon an index rebalancing), and following such occurrence the Notes could be treated as subject to withholding on dividend equivalent payments. Non-U.S. holders that enter, or have entered, into other transactions in respect of the Reference Assets or the Notes should consult their tax advisors as to the application of the dividend equivalent withholding tax in the context of the Notes and their other transactions. If any payments are treated as dividend equivalents subject to withholding, we (or the applicable withholding agent) would be entitled to withhold taxes without being required to pay any additional amounts with respect to amounts so withheld.

#### SUPPLEMENTAL PLAN OF DISTRIBUTION (CONFLICTS OF INTEREST)

Delivery of the Notes will be made against payment for the Notes on September 5, 2018, which is the third (3rd) business day following the Trade Date (this settlement cycle being referred to as “T+3”). See “Plan of Distribution” in the prospectus dated January 8, 2016. For additional information as to the relationship between us and RBCCM, please see the section “Plan of Distribution—Conflicts of Interest” in the prospectus dated January 8, 2016.

We will deliver the Notes on a date that is greater than two business days following the Trade Date. Under Rule 15c6-1 of the Exchange Act, trades in the secondary market generally are required to settle in two business days, unless the parties to any such trade expressly agree otherwise. Accordingly, purchasers who wish to trade the Notes more than two business days prior to the original Issue Date will be required to specify alternative arrangements to prevent a failed settlement.

The value of the Notes shown on your account statement may be based on RBCCM’s estimate of the value of the Notes if RBCCM or another of our affiliates were to make a market in the Notes (which it is not obligated to do). That estimate will be based upon the price that RBCCM may pay for the Notes in light of then prevailing market conditions, our creditworthiness and transaction costs. For a period of approximately three months after the issue date of the Notes, the value of the Notes that may be shown on your account statement

P-23 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

may be higher than RBCCM's estimated value of the Notes at that time. This is because the estimated value of the Notes will not include the underwriting discount and our hedging costs and profits; however, the value of the Notes shown on your account statement during that period may initially be a higher amount, reflecting the addition of RBCCM's underwriting discount and our estimated costs and profits from hedging the Notes. This excess is expected to decrease over time until the end of this period. After this period, if RBCCM repurchases your Notes, it expects to do so at prices that reflect their estimated value.

We may use this pricing supplement in the initial sale of the Notes. In addition, RBCCM or another of our affiliates may use this pricing supplement in a market-making transaction in the Notes after their initial sale. Unless we or our agent informs the purchaser otherwise in the confirmation of sale, this pricing supplement is being used in a market-making transaction.

No Prospectus (as defined in Directive 2003/71/EC (as amended, the "Prospectus Directive")) will be prepared in connection with the Notes. Accordingly, the Notes may not be offered to the public in any member state of the European Economic Area (the "EEA"), and any purchaser of the Notes who subsequently sells any of the Notes in any EEA member state must do so only in accordance with the requirements of the Prospectus Directive, as implemented in that member state.

The Notes are not intended to be offered, sold or otherwise made available to, and should not be offered, sold or otherwise made available to, any retail investor in the EEA. For these purposes, the expression "offer" includes the communication in any form and by any means of sufficient information on the terms of the offer and the Notes to be offered so as to enable an investor to decide to purchase or subscribe the Notes, and a "retail investor" means a person who is one (or more) of: (a) a retail client, as defined in point (11) of Article 4(1) of Directive 2014/65/EU (as amended, "MiFID II"); or (b) a customer, within the meaning of Insurance Distribution Directive 2016/97/EU, as amended, where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II; or (c) not a qualified investor as defined in the Prospectus Directive. Consequently, no key information document required by Regulation (EU) No 1286/2014 (as amended, the "PRIIPs Regulation") for offering or selling the Notes or otherwise making them available to retail investors in the EEA has been prepared, and therefore, offering or selling the Notes or otherwise making them available to any retail investor in the EEA may be unlawful under the PRIIPs Regulation.

#### STRUCTURING THE NOTES

The Notes are our debt securities, the return on which is linked to the performance of the Reference Assets. As is the case for all of our debt securities, including our structured notes, the economic terms of the Notes reflect our actual or perceived creditworthiness at the time of pricing. In addition, because structured notes result in increased operational, funding and liability management costs to us, we typically borrow the funds under these Notes at a rate that is more favorable to us than the rate that we might pay for a conventional fixed or floating rate debt security of comparable maturity. Using this relatively lower implied borrowing rate rather than the secondary market rate, is a factor that reduced the initial estimated value of the Notes at the time their terms were set. Unlike the estimated value included in this pricing supplement, any value of the Notes determined for purposes of a secondary market transaction may be based on a different funding rate, which may result in a lower value for the Notes than if our initial internal funding rate were used.

In order to satisfy our payment obligations under the Notes, we may choose to enter into certain hedging arrangements (which may include call options, put options or other derivatives) on the issue date with RBCCM or one of our other subsidiaries. The terms of these hedging arrangements take into account a number of factors, including our creditworthiness, interest rate movements, the volatility of the Reference Assets, and the tenor of the Notes. The

economic terms of the Notes and their initial estimated value depend in part on the terms of these hedging arrangements.

The lower implied borrowing rate is a factor that reduced the economic terms of the Notes to you. The initial offering price of the Notes also reflects the underwriting commission and our estimated hedging costs. These factors resulted in the initial estimated value for the Notes on the Trade Date being less than their public offering price. See “Selected Risk Considerations—The Initial Estimated Value of the Notes Is Less than the Price to the Public” above.

P-24 RBC Capital Markets, LLC

---

Auto-Callable Contingent Coupon Barrier Notes Linked to the  
Lesser Performing of One Exchange Traded Fund and One  
Equity Index  
Royal Bank of Canada

#### VALIDITY OF THE NOTES

In the opinion of Norton Rose Fulbright Canada LLP, the issue and sale of the Notes has been duly authorized by all necessary corporate action of the Bank in conformity with the Indenture, and when the Notes have been duly executed, authenticated and issued in accordance with the Indenture and delivered against payment therefor, the Notes will be validly issued and, to the extent validity of the Notes is a matter governed by the laws of the Province of Ontario or Québec, or the laws of Canada applicable therein, and will be valid obligations of the Bank, subject to equitable remedies which may only be granted at the discretion of a court of competent authority, subject to applicable bankruptcy, to rights to indemnity and contribution under the Notes or the Indenture which may be limited by applicable law; to insolvency and other laws of general application affecting creditors' rights, to limitations under applicable limitations statutes, and to limitations as to the currency in which judgments in Canada may be rendered, as prescribed by the Currency Act (Canada). This opinion is given as of the date hereof and is limited to the laws of the Provinces of Ontario and Québec and the federal laws of Canada applicable thereto. In addition, this opinion is subject to customary assumptions about the Trustee's authorization, execution and delivery of the Indenture and the genuineness of signatures and certain factual matters, all as stated in the letter of such counsel dated January 8, 2016, which has been filed as Exhibit 5.1 to Royal Bank's Form 6-K filed with the SEC dated January 8, 2016.

In the opinion of Morrison & Foerster LLP, when the Notes have been duly completed in accordance with the Indenture and issued and sold as contemplated by the prospectus supplement and the prospectus, the Notes will be valid, binding and enforceable obligations of Royal Bank, entitled to the benefits of the Indenture, subject to applicable bankruptcy, insolvency and similar laws affecting creditors' rights generally, concepts of reasonableness and equitable principles of general applicability (including, without limitation, concepts of good faith, fair dealing and the lack of bad faith). This opinion is given as of the date hereof and is limited to the laws of the State of New York. This opinion is subject to customary assumptions about the Trustee's authorization, execution and delivery of the Indenture and the genuineness of signatures and to such counsel's reliance on the Bank and other sources as to certain factual matters, all as stated in the legal opinion dated January 8, 2016, which has been filed as Exhibit 5.2 to the Bank's Form 6-K dated January 8, 2016.

P-25 RBC Capital Markets, LLC

---